

surplus electric power has not been completed], and charging the secondary battery to a
[replacing the charge capacity with the] charge capacity [in the] of a preceding charge cycle.

34. (once amended) A secondary battery storage system for connection to a power system,
the storage system comprising:

- a secondary battery connected to a secondary battery load;
- a detecting device for detecting a residual electric power of said secondary battery;
- a connection [charge/discharge] unit connected to the power system and to said
secondary battery; and

- a signal line for transmitting information about said secondary battery through said
detecting device to said connection [charge/discharge] unit, wherein said connection
[charge/discharge] unit controls charging and discharging of the secondary battery on the basis
of said information, and wherein said information comprises measured values for determining
residual electric power stored in the secondary battery. wherein for discharging the residual
electric power said connection unit selects either the secondary battery load or the power
system depending on the residual electric power stored in the secondary battery.

REMARKS

Claims 1-5, 7-16, 18-23 and 25-34 are pending in the application. Claims 1-34 are
rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 1-5, 19 and 34
are rejected under 35 U.S.C. §102(b) as anticipated by Yang. Claims 1, 2, 19-33 and 34 are
rejected under 35 U.S.C. §102(e) as anticipated by Imaizumi. Claims 1-5, 7-11 are rejected
under 35 USC 103(a) as being unpatentable in view of Yang in view of Martin. Claims 12-16
and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Qualich. These
rejections are respectfully hereby traversed.

Rejection - 35 U.S.C. §112

Claims 1-34 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite.
Each rejection is addressed individually.

Regarding claim 1, the rejection is that the term “power system” and its function are
unclear. According to the description, “[t]he present invention provides an electric power

storage system comprising a connection unit connectable to a *power system*, and connected to at least either a plurality of loads or a plurality of electric power storage units”¹ For example, as shown in Fig. 2, everything connected to the top of the connection unit 2 is the power system.² The power system functions as both a supplier and a receiver of electrical power. First, the power system charges the secondary battery through the connection unit, one example being a charge stand.³ Second, the power system receives power as electric power is discharged from the secondary battery through the connection unit to the power system.⁴ Regarding the claim, while the storage system is connectable to a power system, it is important to understand the power system is separate from the storage system. Independent claim 3, as originally filed, makes the distinction clear.

Regarding claim 4, “charge/discharge units” is amended to --connection unit--.

Regarding claim 19, “power source” is amended to --power system--.

Regarding claim 20, the claim is hereby amended to address each of the informalities identified.

Regarding claim 33, both claims 20 and 33 are amended to provide antecedent basis for “the charge capacity” and the term “has not been completed” is replaced with clarifying language.

Regarding the term “charge/discharge unit”, while applicant believes this term sufficient, it is replaced throughout with --connection unit-- to further prosecution.

Regarding the phrase “charge/discharge unit discharges the electric power of said secondary battery to said load when said residual electric power is larger than a predetermined value” which existed in the original claims and the phrase “controls said charge/discharge unit on the basis of said information” which existed in the once amended claims, there appears to still be some objection to these phrases under § 112. Therefore, without raising new issues of patentability applicants hereby amend the claims to include a phrase like “--wherein for discharging the residual electric power said connection unit selects either the secondary battery

¹ Specification at page 9, lines 15-18.

² Specification at page 23, lines 9-11.

³ Specification at page 12, lines 13-15.

⁴ Specification at page 5, line 26; page 6, lines 13 and 28; page 29, claim 3, lines 11-12; page 30, claim 4, lines 11-12.

load or the power system depending on the residual electric power stored in the secondary battery--". Applicants submit this phase distinctly recites the claimed invention.

As amended, claims 1-5, 7-16, 18-23 and 25-34 particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Rejection - 35 U.S.C. §102 and §103; Yang

Claims 1-5, 19 and 34 are rejected under 35 U.S.C. §102(b) as anticipated by or in the alternative obvious in view of Yang. Specifically, the rejection is that "Yang discloses: a secondary battery (103) connected to loads (105-1...n); cyclic timing control device (107) which 'senses residual electrical energy' stored in battery 103; charge discharge unit (rectifier 102) connected to both power supply (101) and power system (loads 105-1...n)."⁵ This rejection is respectfully traversed.

In response, claim 1 (twice amended) recites "said control unit controls said connection unit on the basis of said information, wherein said information comprises measured values for determining a residual electric power stored in the secondary battery, wherein for discharging the residual electric power said connection unit selects either the secondary battery load or the power system depending on the residual electric power stored in the secondary battery." According to the specification,

[t]he intrinsic optimum charge and discharge characteristics of the secondary battery, and the power demand of the plurality of loads or the power storage condition of the plurality of electric power storage units are measured and a load to which power is to be fed is selected. . . . For example, a load to which power is to be fed and the amount of power to be fed are determined selectively after examining power demand to see if the power demand can be supplied by the secondary battery and to see if the output current density (large-current discharge or small-current discharge) is appropriate to the secondary battery, and then the connection unit connects the secondary battery to the selected load to feed power to the latter by orders of the controller.⁶

In the case of the invention as claimed in claim 1 (twice amended), power is directed from the secondary battery to either the secondary battery load or the power system by the connection unit depending upon the measured residual capacity of the secondary battery. Yang, however,

⁵ Office Action mailed June 30, 1997 at 4.

⁶ Specification at page 13, line 32 through page 14, line 15.

fails to teach or suggest a connection unit as claimed in claim 1 (twice amended). In Yang, a “cyclic timing device 107 controls the application of AC source 101 to rectifier 102 and relay battery 103”⁷ “Cyclic timing control device also senses the residual electrical energy already stored in intermediate storage battery 103 and controls *charging* in accordance” with the residual electric energy and the present time relative to the charge cycle.⁸ This is similar to timing control devices discussed in the background of the invention of the present specification. The timing control device merely estimates the residual charge in the intermediate storage battery to decide whether to deliver power to the battery during the charge cycle. The timing control device does not have the ability to select a discharge load. Also, the individual output control devices 104-1 . . . n are connected between the intermediate storage battery 103 and each of the external batteries 105-1 . . . n⁹ and “include [various voltage, current, time, etc. devices] for detecting the saturation and/or polarity of the *charged external batteries* 105-1 . . . n.”¹⁰ Thus, in Yang the external batteries are connected to the intermediate battery depending on the charge characteristics of the external batteries rather than the optimum discharge characteristics of the intermediate storage battery.

Therefore, because Yang fails to disclose or even suggest a connection unit similar to the present invention as claimed in claim 1 (twice amended), the invention as claimed is novel and nonobvious in view of Yang.

Regarding claims 2-5, the invention as claimed in these claims is also novel and nonobvious in view of the Yang because they include the connection unit limitation.¹¹ Similarly, the invention as claimed in claim 34 (once amended) is patentable.

Regarding claim 19, the claim recites “selecting the power system for discharging a residual electric power of the secondary battery through the connection unit after an electric power stored in the secondary battery is discharged to the secondary battery load, depending on the residual electric power stored in the secondary battery.” As noted above, Yang fails to teach any selection for discharging. Therefore, the invention as claimed in claim 19 (twice amended) is novel and nonobvious in view of Yang.

⁷ Yang at col. 2, lines 20-22.

⁸ Yang at col. 3, lines 18-39 (emphasis added).

⁹ Yang at col. 2, lines 61-63.

¹⁰ Yang at col. 3, lines 58-65 (emphasis added).

¹¹ 35 USC § 112, fourth paragraph.

Rejection - 35 U.S.C. §102; Imaizumi

Claims 1, 2, 19-33 and 34 are rejected under 35 U.S.C. §102(e) as anticipated by Imaizumi. Specifically, with regard to claims 1, 2 and 34, the rejection is that Imaizumi discloses “a secondary battery (7) connected to secondary battery loads (50), voltage detection device (15) for determining residual power of battery (7), voltage converter (4) which is a charge unit for secondary battery (7) connected to the power system for the vehicle and to the secondary battery (7), controller (8) connected to converter (4) and signal (10, 11) which sends a signal related to the condition of battery (7) to the controller to control the operation of converter (4).” This rejection is respectfully traversed.

In response, claim 1 (twice amended) recites “said control unit controls said connection unit on the basis of said information, wherein said information comprises measured values for determining a residual electric power stored in the secondary battery, wherein for discharging the residual electric power said connection unit selects either the secondary battery load or the power system depending on the residual electric power stored in the secondary battery.” Imaizumi, however, fails to teach or suggest a connection unit as claimed in claim 1 (twice amended). In Imaizumi, an electrical system is disclosed for suppressing energy loss in a DC-DC, 48-volt to 12-volt converter 4.¹² A 12-volt battery 7 is connected in parallel with a head lamp 5, a vehicle speed sensor 30 and a resistance 40.¹³ The head lamp 5, vehicle speed sensor 30 and resistance 40 are collectively referenced as load 50.¹⁴ A voltmeter detects the voltage V across the 12-volt battery 7 and an ammeter 16 detects the load current H across the load 50.¹⁵ When V drops below a value Va, the 12-volt battery 7 is charged by a high voltage secondary battery 2 through the DC-DC converter 4. However, in order to suppress energy loss in the DC-DC converter 4 *during charging*, the load current H across the load 5 is checked. If the load current H is too low, switch 20 is engaged to raise the load current H to at least Ao at which the DC-DC converter 4 operates efficiently.¹⁶

Therefore, because Imaizumi teaches that resistance 40 should be engaged by switch 20 *only during the charge cycle* of 12-volt battery 7 to conserve energy dissipation in the DC-DC

¹² Imaizumi at col. 1, lines 30-39.

¹³ Imaizumi at col. 2, lines 51-60.

¹⁴ Imaizumi at col. 2, lines 62-64.

¹⁵ Imaizumi at col. 2, lines 48-50 and 64-66.

¹⁶ Imaizumi at col. 5, lines 8-19.

converter 4, the present invention as claimed in claim 1 directed to selection of a load for discharge based on information from the secondary battery is patentable in view of Imaizumi.¹⁷

For similar reasons, the invention as claimed in claims 2 and 34 is novel and nonobvious in view of Imaizumi.

Regarding claims 19-33, the claims recite selecting the power system, loads or storage units for discharging, *depending on the residual electric power in the secondary battery*. However, in Imaizumi the resistance 40 is added in parallel with the other load, *depending on the load current H across the load 50*.¹⁸ It is suggested in the rejection that Imaizumi discloses “discharging secondary battery to resistance 40 to increase the load current and decrease the secondary battery terminal voltage before charging commences (see especially col. 5, line 8-32).”¹⁹ However, when the switch 20 is thrown to direct current to resistance 40, the voltage V has already been determined to have discharge down to V_a at step 100 in Figure 6. The voltage is not allowed to drop below V_a because low voltage causes an unstable energy supplement to the load such as, to the head lamp.²⁰ Rather than allowing the battery 7 to further discharge, the converter 4 is immediately turned on in step 103 after the switch 20 is thrown in step 102 to supply stable power to the load and to recharge the battery 7.²¹ Until the voltage V of battery 7 is charged back up to V_c , the converter 4 and switch 20 remain active.²² Resistance 40 is only activated to improve the efficiency of the DC-DC converter 4 during charging, not to further discharge the battery 7. Therefore, because Imaizumi fails to teach or suggest selecting a load which conforms to the optimum discharge characteristics of a secondary battery, the invention as claimed in claims 19-33 is novel and nonobvious.

Rejection - 35 U.S.C. §103; Yang and Martin

Claims 1-5, 7-11 are rejected under 35 USC 103(a) as being unpatentable over Yang in view of Martin. In response, as noted above, claim 1 (twice amended) recites “said connection unit selects [a load] depending on the residual electric power stored in the secondary battery.”

¹⁷ Imaizumi at col. 5, lines 41-55.

¹⁸ Imaizumi at col. 5, lines 1-7.

¹⁹ Office Action mailed June 30, 1997 at pages 5-6.

²⁰ Imaizumi at col. 3, lines 22-40.

²¹ Imaizumi at col. 5, lines 25-26.

²² Imaizumi at col. 5, lines 33-40.

Yang fails to teach or suggest a connection unit which selects loads for discharging. Similarly, Martin also fails to teach or suggest the claimed connection unit. Rather, as noted in the rejection, "Martin discloses a computer programmed battery *charge* control system."²³ While the system does give "a warning of extreme discharge conditions,"²⁴ there is no teaching or suggestion of a control to discharge depending on the residual charge of the battery. In fact, the warning system of Martin teaches away from the present invention wherein "[t]he seven segment readout U12 displays 'low battery' condition by the letter L indicating that the battery is deeply discharged and is at or below a threshold of, for example, 20% of CAPRT, a warning that this state has been reached and requiring immediate recharge in order to avoid battery [sic] damage."²⁵ Because Martin teaches that the battery should be recharged to avoid damage, rather than discharged under control depending on the residual capacity, Martin fails to teach or suggest the invention. Therefore, the invention as claimed in claims 1-5 and 7-11 is nonobvious in view of the combined teachings of Yang and Martin.

Rejection - 35 U.S.C. §103; Qualich and Decker

Claims 12-16 and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Qualich in view of Decker. As noted above, claim 12 (twice amended) recites "a control unit for controlling the connection unit on the basis of information from the secondary battery and at least one of the loads of the plurality of loads or at least one of the units of the plurality of electric power storage units, wherein for discharging the residual electric power said connection unit selects at least a load of said plurality of loads or a unit of said plurality of electric power storage units depending on the residual electric power stored in the secondary battery" Both Qualich and Decker fail to teach or suggest these elements. In Qualich, a system is disclosed to effectively manage power dissipation in a circuit which charges the secondary battery.²⁶ Decker teaches a battery recharging system which controls individual solar panel to produce the desired charge characteristics. Therefore, because both references fail to give any consideration to the discharge characteristics of the battery, the invention as claimed in claims 12-16 and 18 is nonobvious in view of the combined teachings.

²³ Office Action mailed June 30, 1997 at 6.

²⁴ Martin at col. 1, line 30.

²⁵ Martin at col. 7, lines 6-11.

²⁶ Qualich at col. 3, lines 24-27.

Conclusion

Claims 1-5, 7-16, 18-23 and 25-34 are pending in the application. Claims 1-34 particularly claim the invention under 35 U.S.C. §112, second paragraph. The invention as claimed in claims 1-5, 19 and 34 is novel under 35 U.S.C. §102(b) in view of Yang. The invention as in claims 1, 2, 19-33 and 34 is novel 35 U.S.C. §102(e) in view of Imaizumi. The invention as in claims 1-5, 7-11 is nonobvious under 35 USC 103(a) in view of Yang and Martin. The invention as in claims 12-16 and 18 is nonobvious under 35 U.S.C. §103(a) over Qualich. Therefore, applicants hereby request withdraw of the rejections and allowance of all pending claims.

Respectfully submitted,

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